

ONTARIO MINISTRY OF ENVIRONMENT
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1969

**OPERATING
SUMMARY**

BRANTFORD

water pollution control plant

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1969
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ARIO WATER
RES COMMISSION

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ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

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Brantford : water pollution
control plant.
81593



Water management in Ontario

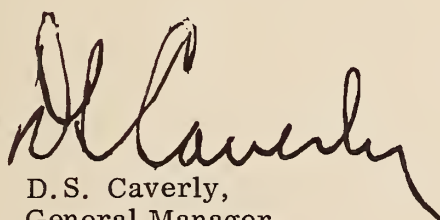
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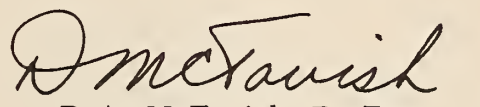
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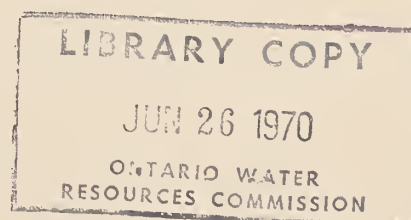
The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.


D.S. Caverly,
General Manager.


D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.





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water pollution control plant

operated for

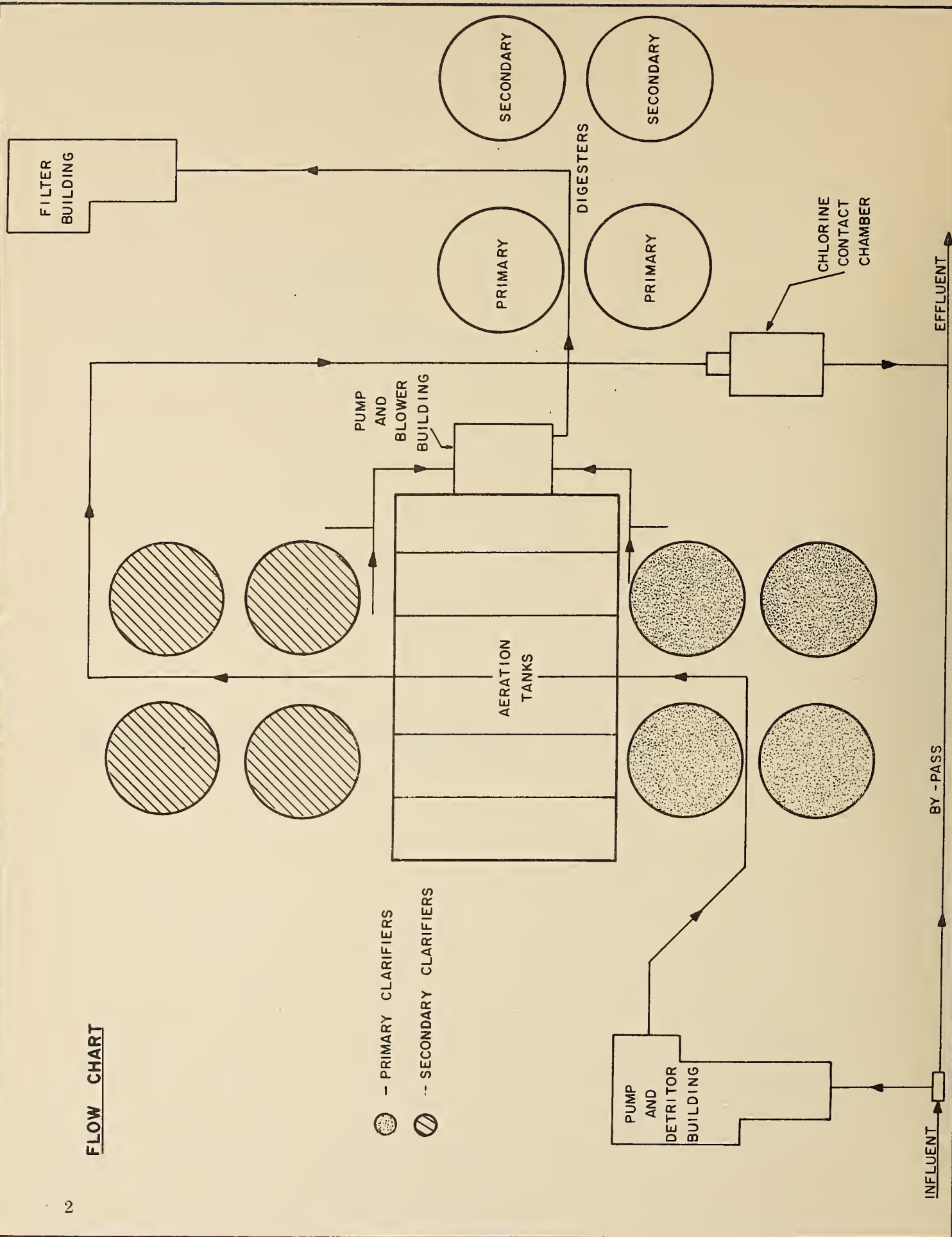
THE CITY OF BRANTFORD

by the

ONTARIO WATER RESOURCES COMMISSION

1969 ANNUAL OPERATING SUMMARY

FLOW CHART



- PRIMARY CLARIFIERS
- SECONDARY CLARIFIERS

DESIGN DATA

PROJECT NO.	2-0011-58	TREATMENT	Activated Sludge
DESIGN FLOW	12.5 mgd	DESIGN POPULATION	65,000
BOD - Raw Sewage - Removal	170 mg/l 90%	SS - Raw Sewage - Removal	175 mg/l 90%

PRIMARY TREATMENT

Screening

Type: Coarse bar screens
Size: Two 5-in. spaces

Comminution

Type: Infilco Rotogrator
Size: Two No. 43 (8 mgd ea)

Raw Sewage Pumps

Type: Fairbanks-Morse
Size: Four 3840 gpm ea @ 45' tdh

Grit Removal

Type: Dorr Detritor, Type WA
Size: Two 20' x 20' x 1'-3"
Flow Velocity: 1 fps
Retention: 0.725 min

Primary Sedimentation

Type: Eimco, Type C
Size: Four 70' dia x 10' swd
Retention: 2 hours
Loading: Surface, 812 gal/ft²/day
Weir, 14,200 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; triple pass
(Two tanks)
Size of pass, 200' x 30' x 15'
Retention: 7.5 hr

Air Supply

Type: Sutorbilt blowers
Size: Three 4300 cfm

Air Diffusers

Type: Spargers

Spacing: 144 per pass @ 16 $\frac{1}{2}$ " centres
Total: 864

Secondary Sedimentation

Type: Eimco, Type C
Size: Four 70' dia x 10' swd
Retention: 2 hr
Loading: Surface, 812 gal/ft²/day
Weir, 14,200 gal/ft/day

CHLORINATION

Chlorinator

Type: Fischer & Porter
Manual adjustment - liquid chlorine evaporator

Chlorine Contact Chamber

Size: 51' x 18' x 7'
Retention: 5 min

OUTFALL

Grand River

SLUDGE HANDLING

Digestion System

Type: Two-stage
Primary -- Two 55' dia tanks with two
D-O-L mixers each
Volume 49,300 cu ft or 300,000
gal (each tank)
Loading 6.1 lb/ft³/mo
Secondary--Two 70' dia tanks with Dorr
floating covers
Volume 97,200 cu ft or 600,000
gal (each tank)
Total Loading: 2.0 lb/ft³/mo

Vacuum Filter

Type: Komline-Sanderson coil filters
Size: Two 350 sq ft filters

'69 REVIEW

GENERAL

The new liquid sludge disposal program was implemented in July and is operating satisfactorily. As a result, it is anticipated that the 1970 operating cost will be maintained at the 1969 level.

The modifications to the aeration section and return sludge pumping facilities were accepted as an OWRC municipal project. Construction for these works should start in mid-1970.

Staff were successful in arresting brick spalling on the secondary digesters. They are still experimenting with various methods to control spalling on the primary digesters.

A major overhaul of the vacuum filters was initiated in August. The filters will be ready for service by March, 1970, should any difficulty develop with the liquid sludge disposal program.

A total of 2,781.7 million gallons of raw sewage was treated in 1969, an increase of 5.34% over the 1968 flows.

The organic removal efficiency improved considerably over the previous year and is attributed to a weaker strength of raw sewage received at the plant. The average BOD removal efficiency was 94% in 1969 compared with only 89% in 1968.

PLANT FLOWS and CHLORINATION

The average daily flow was 7.6 million gallons, an increase of 0.38 million gallons over 1968. The maximum daily flow of 12.6 million gallons occurred in January and the minimum of 3.3 million gallons in December.

The chlorine dosage rate of 2.5 milligrams per litre was similar to last year's dosage.

PLANT EFFICIENCY

The average BOD concentrations in the raw sewage decreased by approximately 23% from 1968. Higher stormwater flows due to increased rainfall in 1969 were believed to have caused the weaker-strength raw sewage. As a result, effluent quality improved from an average of 26 mg/l BOD in 1968 to 9 mg/l in 1969. The effluent suspended solids concentrations of 15 mg/l compared with the average effluent quality of 12 mg/l in 1968. Both the average BOD and suspended solids effluent concentrations were within the OWRC objectives of 15 mg/l.

EXPENDITURES

The 1969 operating costs for the Brantford plant were \$254,678.50, or

\$91.56 per million gallons treated. The increase in operating costs over 1968 was one percent.

SLUDGE DIGESTION and DISPOSAL

A total of 16,120,000 gallons of raw sludge was pumped to the primary digesters, representing a decrease of 19% from 1968. The average solids concentrations of 5.1% was less than the 1968 average of 5.3%.

The brick spalling on the secondary digesters has been arrested. A special compound which was used to caulk the joints between the stone caps on top of the digesters' walls has been successful in preventing water from gaining access to the cavity between the brick cladding and the concrete section of the wall. Staff are experiencing difficulties in containing the brick spalling on the primary digesters, but hope to remedy this in the near future.

VACUUM FILTRATION

The filters were operated for a period of six-and-a-half months and then removed from service in order to implement the new liquid sludge disposal program. Liquid digested sludge was hauled to a field near the plant by plant-owned sludge trucks for the remaining five-and-a-half months of the year.

The cost for liquid sludge disposal at 50.2 cents per liquid yard compared favourably with the 1967 cost of 73 cents per liquid yard for vacuum filtration and filter cake haulage.

AERATION

Removal efficiencies in the primary section of the plant were 22.7% for BOD and 52.3% for suspended solids. The mixed liquor suspended solids averaged 2,930 mg/l, 14% greater than the 1968. Tank loading averaged 11 lbs. BOD per 100 lbs. MLSS compared with 13 lbs. in 1968.

Low dissolved oxygen concentrations in the aeration section were not experienced as often as in the previous year. This is attributed to the lower strength raw sewage. Towards the end of 1969, raw sewage strengths began to increase, and it is anticipated that the 1970 strengths will be similar to those of 1968.

The problem of low dissolved oxygen levels will be corrected when the modifications to the aeration section and return sludge pumping facilities are completed either at the end of 1970 or early in 1971.

CONCLUSIONS

1. The liquid sludge disposal program is progressing satisfactorily and economically.
2. The problem of low dissolved oxygen levels in the aeration section will be corrected when modifications to this section are completed.
3. The increased flows were offset by a decrease in raw sewage strengths, which resulted in a better quality effluent than was experienced in 1968.

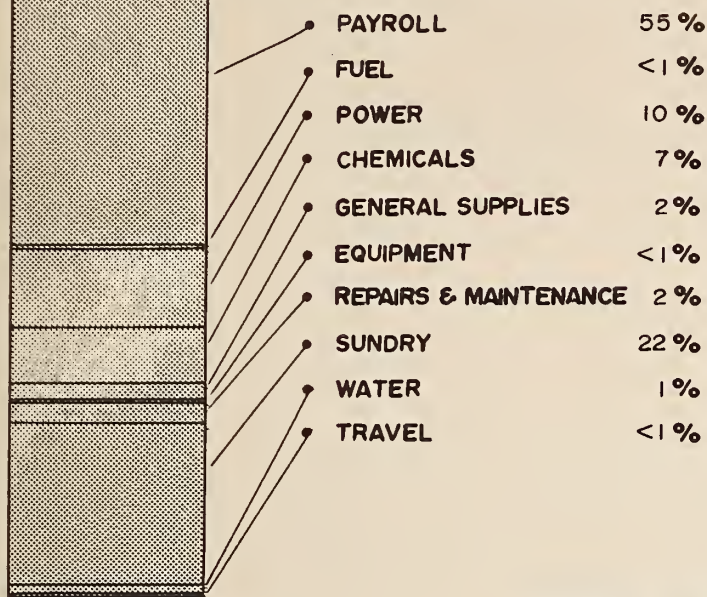
PROJECT COSTS

NET CAPITAL COST (Final)	\$2,250,950.02
DEDUCT - Payments from Municipality	<u>493,126.02</u>
Long Term Debt to OWRC	<u><u>\$1,757,824.00</u></u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	\$ <u><u>539,456.05</u></u>
Net Operating	\$ 254,678.50
Debt Retirement	46,653.00
Reserve	9,615.01
Interest Charged	<u>98,411.53</u>
TOTAL	\$ <u><u>409,358.04</u></u>

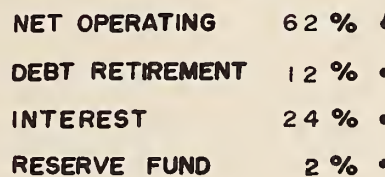
RESERVE ACCOUNT

Balance @ January 1, 1969	\$ 94,924.22
Deposited by Municipality	9,615.01
Interest Earned	<u>5,303.24</u>
	\$ 109,842.47
Less Expenditures	<u>22,710.98</u>
Balance @ December 31, 1969	\$ <u><u>87,131.49</u></u>

1969 OPERATING COSTS



TOTAL ANNUAL COST



Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1965	2395	\$185,704.83	\$77.53	6 cents
1966	2490	188,867.51	75.83	4 cents
1967	2622	226,643.20	86.44	4 cents
1968	2642	251,764.34	95.31	5 cents
1969	2782.7	254,678.50	91.56	5 cents

Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	16559.85	15493.15	-	-	-	737.88	22.54	-	-	66.38	229.90	-
FEB	15764.60	10858.08	-	-	2426.60	1229.80	423.04	193.82	66.59	566.67	-	-
MAR	21982.54	10451.38	-	-	2309.03	3361.30	400.92	204.09	301.23	4724.69	229.90	-
APR	17362.39	10599.47	-	-	2241.20	2582.79	490.60	-	865.88	582.45	-	-
MAY	19123.78	11645.83	-	-	2376.80	1967.68	418.92	(342.51)	541.32	2254.64	229.90	31.20
JUNE	17012.23	10653.90	-	-	2406.20	2338.05	320.47	-	130.52	1153.09	-	10.00
JULY	18437.69	10451.65	130.18	645.75	2347.40	2727.52	545.19	-	280.22	1048.61	261.17	-
AUG	21797.86	15626.77	911.26	-	2533.40	811.59	659.93	959.98	107.82	94.20	-	92.91
SEPT	44210.31	10662.57	330.57	239.14	2328.20	2185.84	286.48	-	1119.70	2677.43	287.38	-
OCT	15875.66	10458.76	-	-	2364.10	-	637.57	1651.65	214.71	548.87	-	-
NOV	14470.57	10500.57	-	-	2479.40	-	152.72	-	723.04	327.46	287.38	-
DEC	32091.02	10280.93	-	137.47	2364.10	-	1414.20	(1590.75)	917.21	18491.01	-	76.85
TOTAL	254678.50	137683.06	1372.01	1022.36	26176.43	17942.45	5772.58	1076.28	5268.24	56628.50	1525.63	210.96

BRACKETS INDICATE CREDIT

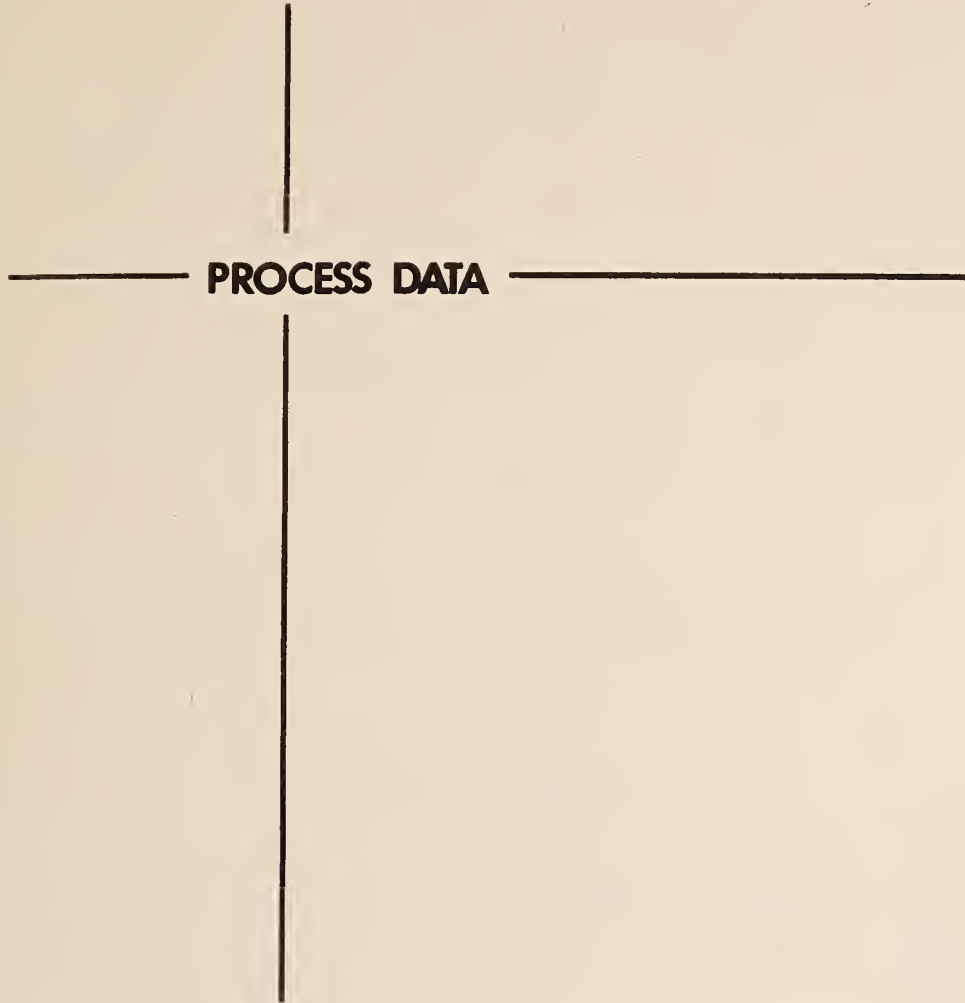
* Note: Operating costs include sludge hauling costs, which were;

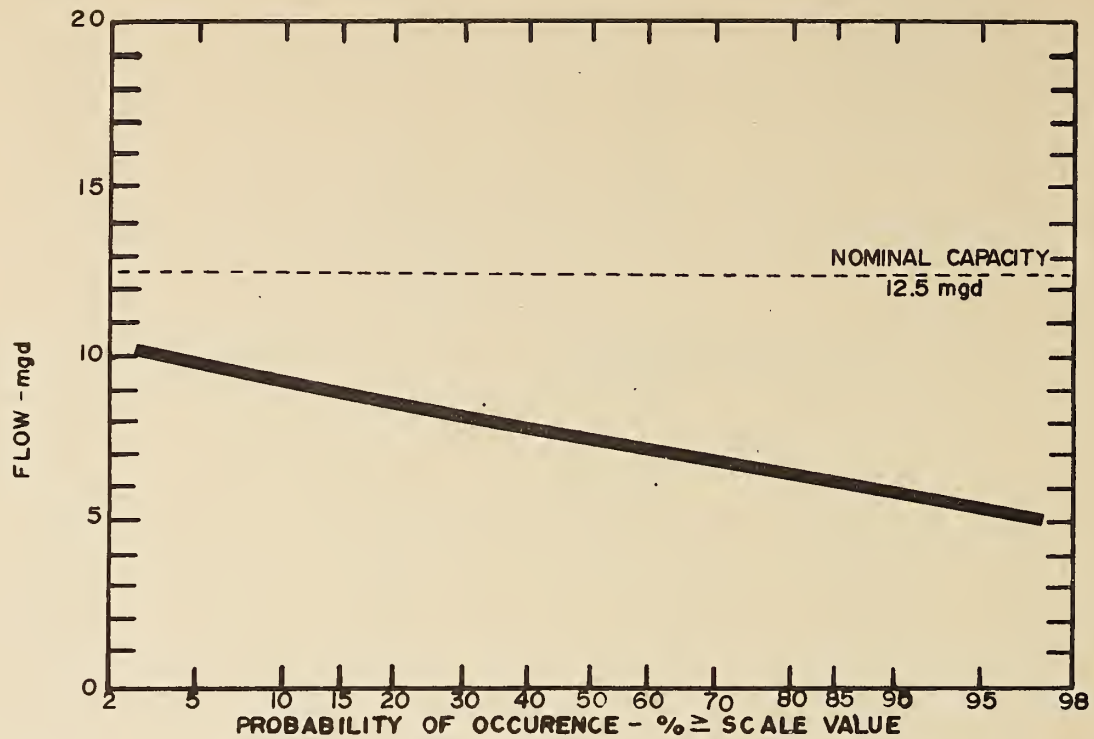
(i) Filtered sludge

\$ 3,470.81

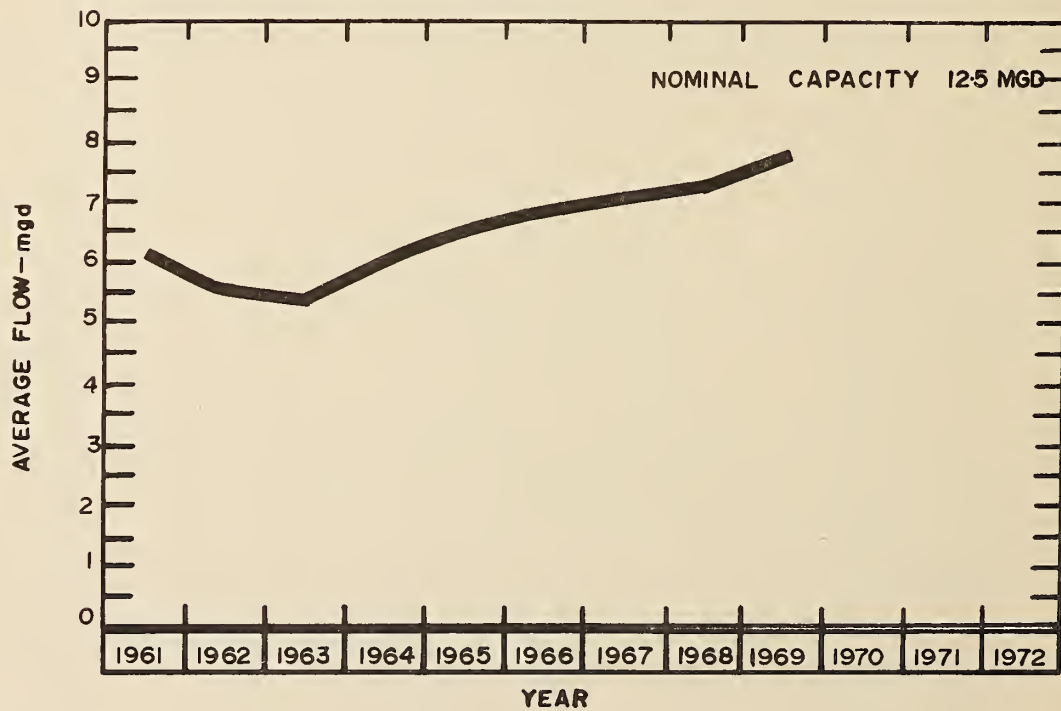
(ii) Liquid digested sludge

\$17,113.60



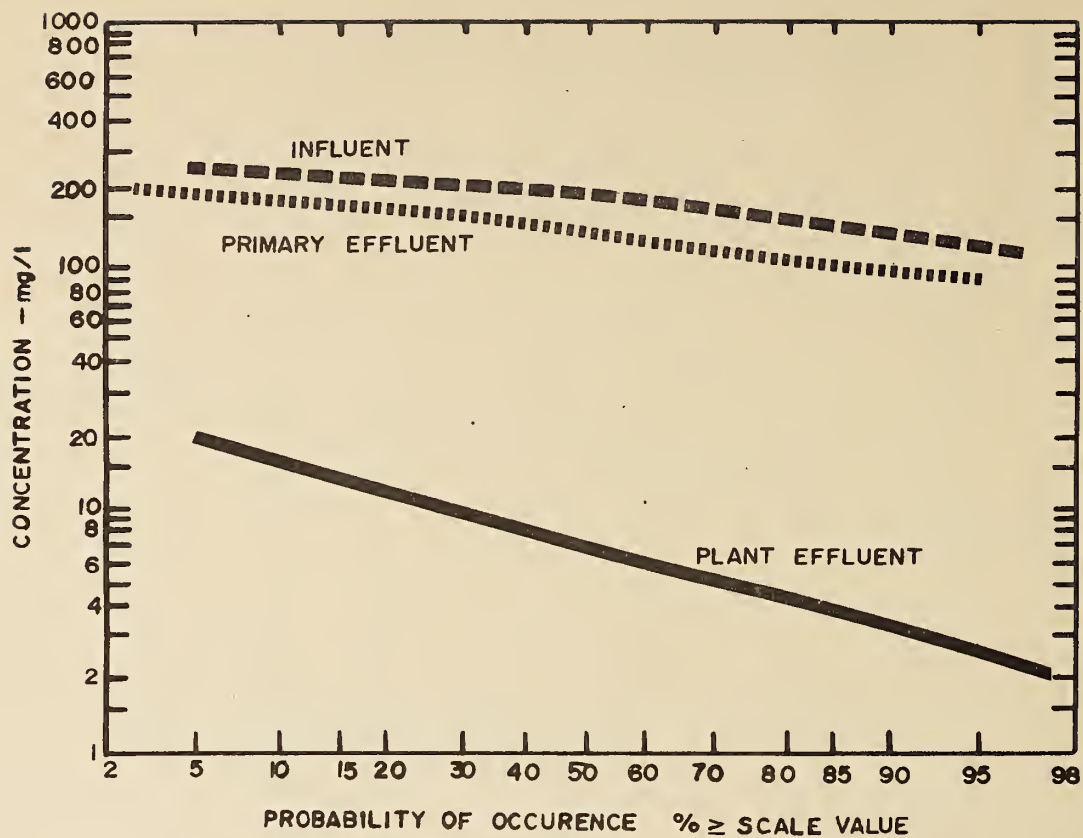


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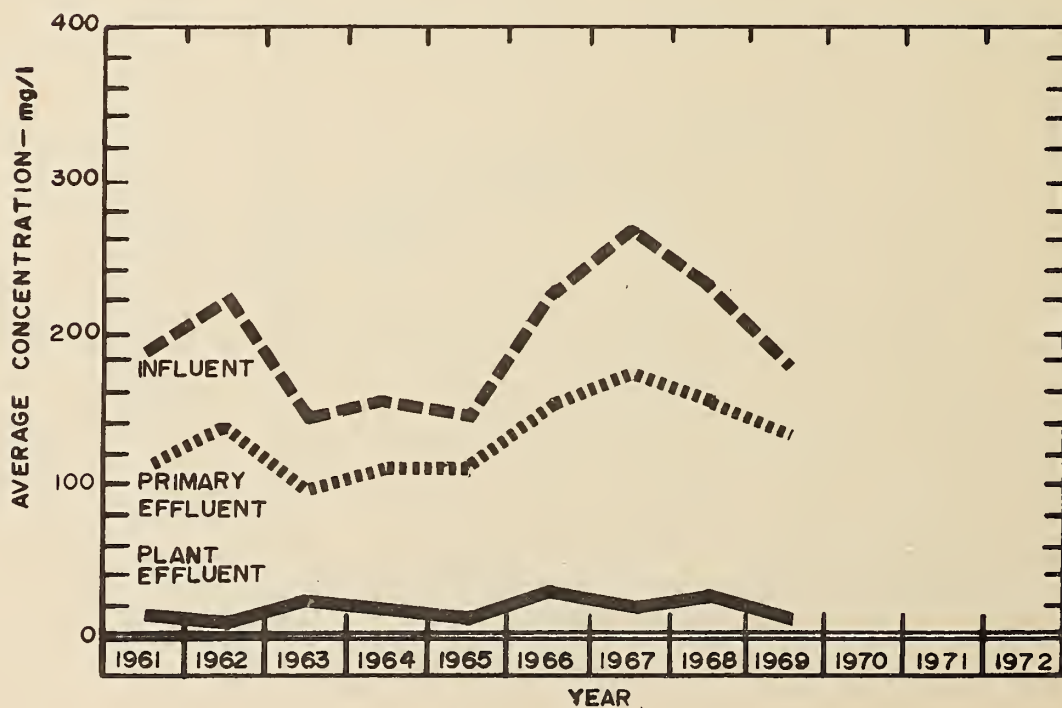


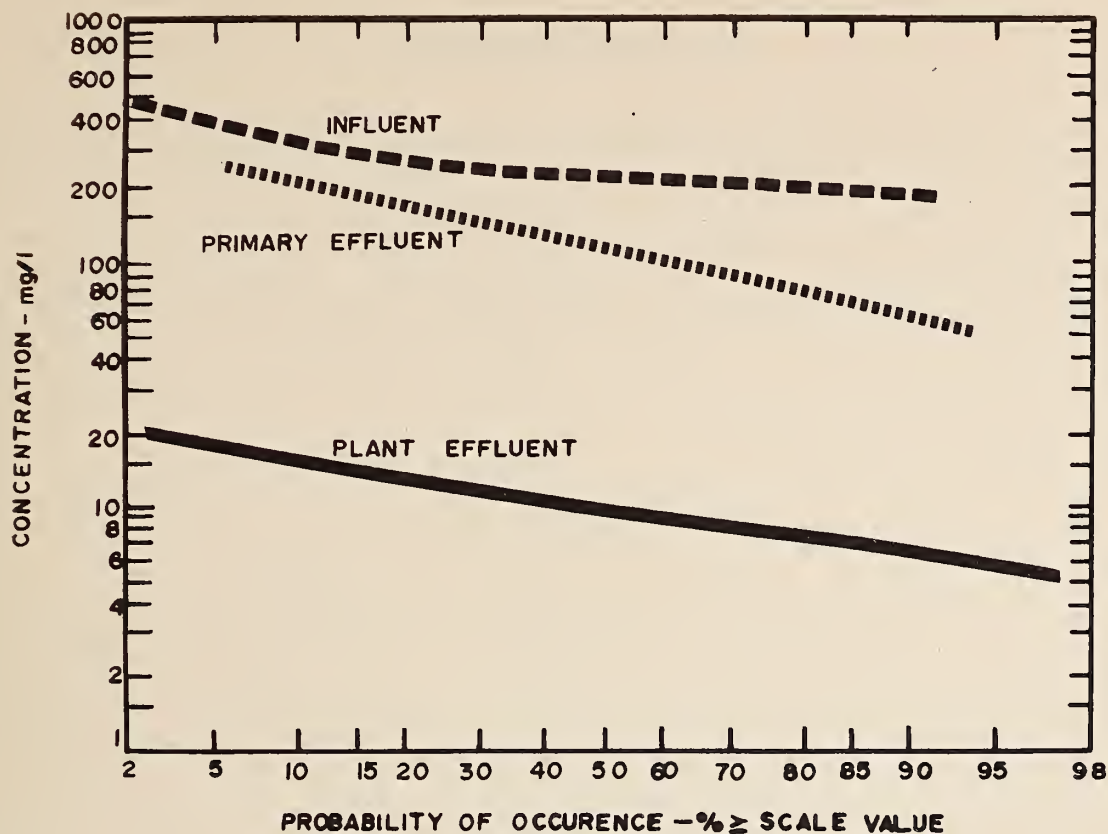
PLANT FLOWS and CHLORINATION

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED 10 ³ pounds	DOSAGE mg/l
JAN	243.8	7.8	12.6	4.3	8.06	3.3
FEB	229.4	8.2	10.2	6.0	5.30	2.3
MAR	228.0	7.4	9.0	5.5	5.78	2.5
APR	269.5	9.0	10.5	7.4	5.88	2.2
MAY	275.1	8.9	11.2	7.2	6.38	2.3
JUNE	239.1	8.0	9.1	5.8	6.16	2.6
JULY	238.5	7.7	9.1	5.6	6.38	2.7
AUG	219.4	7.1	8.4	4.9	4.75	2.2
SEPT	215.1	7.2	8.3	4.8	6.10	2.8
OCT	213.3	6.9	8.0	4.6	5.89	2.7
NOV	213.5	7.1	8.3	5.3	5.48	2.5
DEC	197.0	6.3	7.6	3.3	5.51	2.3
TOTAL	2781.7	-	-	-	71.68	-
AVERAGE	-	7.6	-	-	5.97	2.5

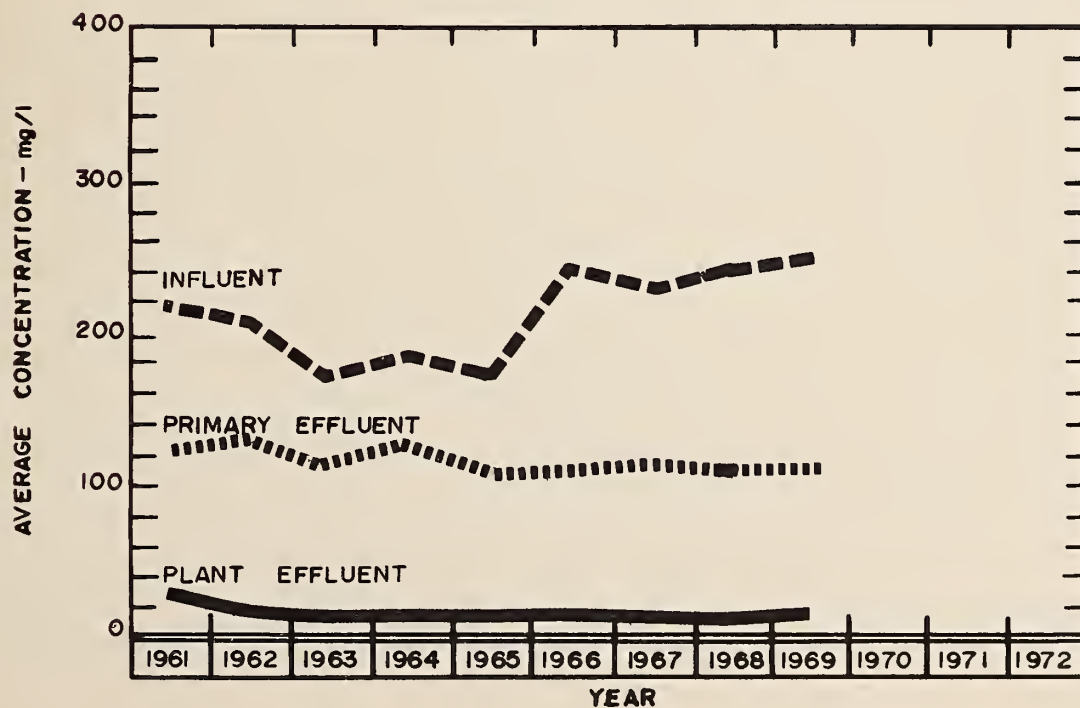


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS

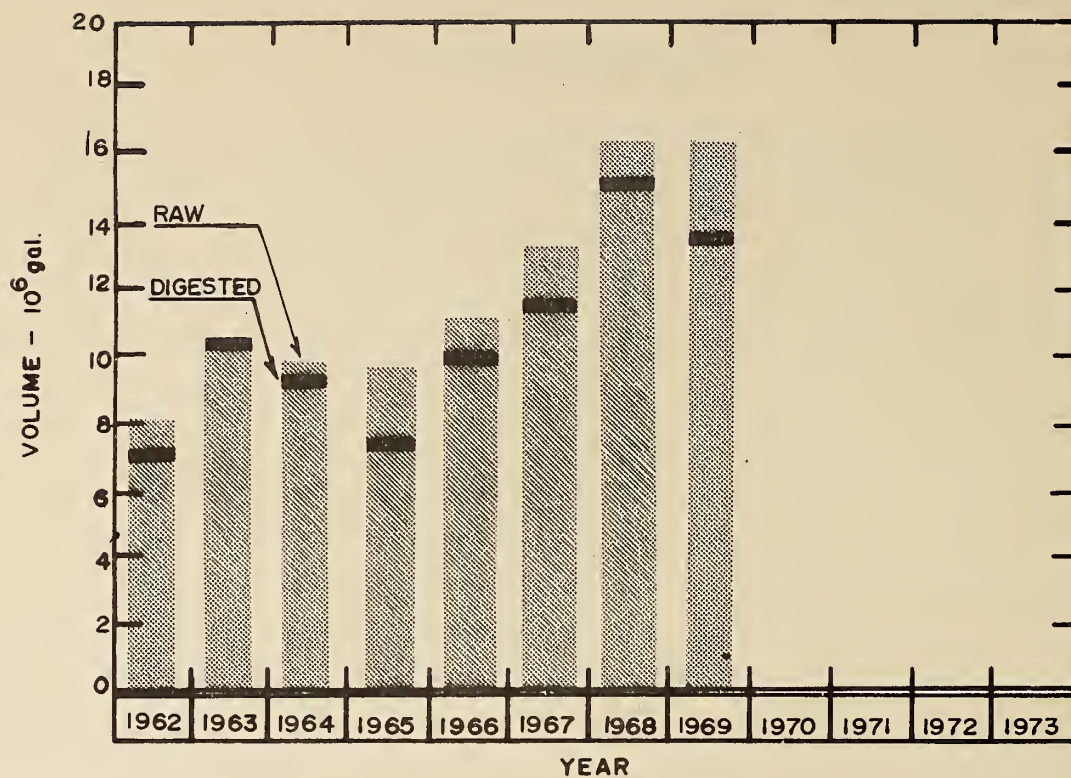


PLANT EFFICIENCY

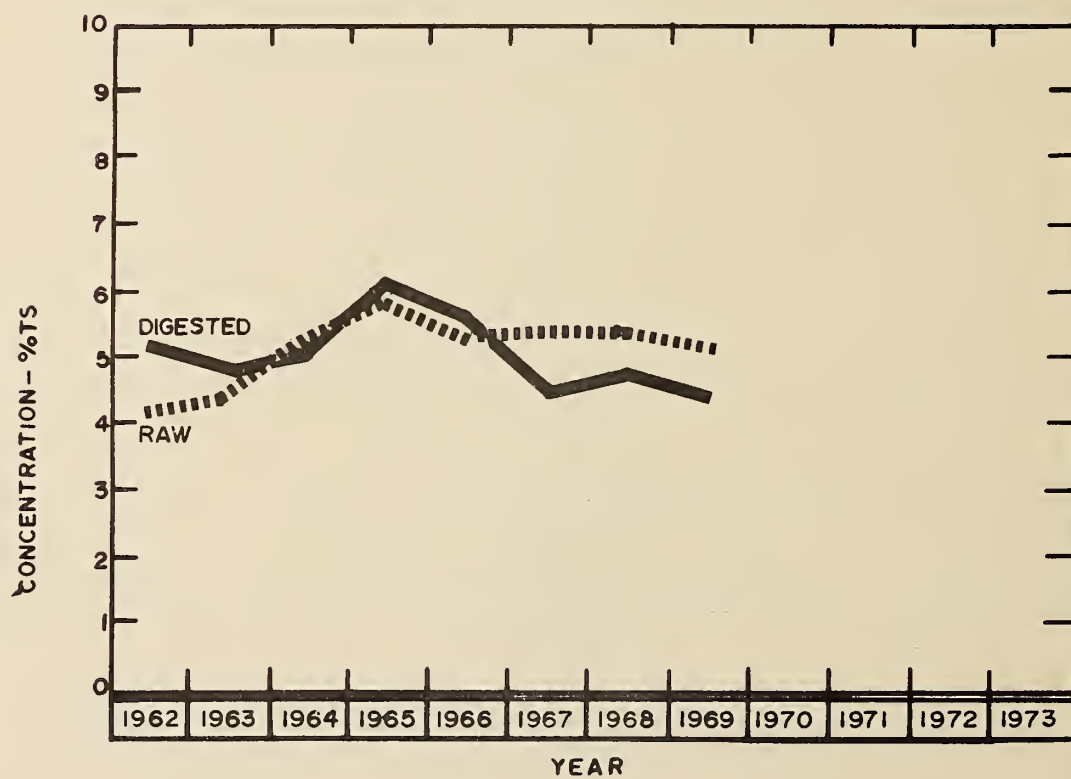
MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL
	INF.	EFF.	REDUCTION		INF. CONCN	EFF. CONCN	REDUCTION		
	mg/l	mg/l	%	10 ⁵ pounds	mg/l	mg/l	%	10 ⁵ pounds	cu ft
JAN	189	14	93	4.27	218	12	94	5.02	584
FEB	185	9	95	4.04	203	9	96	4.45	480
MAR	122	6	95	2.64	249	12	95	5.40	521
APR	188	7	96	4.88	240	10	95	6.20	989
MAY	133	9	93	3.41	254	12	95	6.66	710
JUNE	165	9	94	3.73	249	9	96	5.74	520
JULY	127	6	95	2.89	264	13	95	5.99	601
AUG	160	20	88	3.07	250	12	95	5.22	890
SEPT	195	18	91	3.81	265	15	94	5.38	840
OCT	216	5	98	4.50	271	9	97	5.58	704
NOV	205	6	97	4.25	263	10	96	5.40	478
DEC	234	4	98	4.53	267	12	95	5.02	432
TOTAL	-	-	-	46.02	-	-	-	66.06	7749
AVERAGE	176	9	95	3.83	249	15	96	5.50	645

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF.		SECONDY. EFF.		MLSS CONCN mg/l	F/M lb BOD lb MLSS	AIR USED 1000 cu ft lb BOD	WASTE SLUDGE 10 ⁶ pounds
		BOD	SS	BOD	SS				
		mg/l	CONCN mg/l	mg/l	CONCN mg/l				
JAN	7.8	120	94	14	12	2530	.11	1.48	.306
FEB	8.2	115	95	9	9	2580	.11	1.38	.341
MAR	7.4	146	140	6	12	2860	.11	1.13	.379
APR	9.0	152	189	7	10	3490	.12	.89	.435
MAY	8.9	108	198	9	12	4070	.07	1.26	0
JUNE	8.0	119	168	9	9	3850	.08	1.27	0
JULY	7.7	90	130	6	13	3490	.06	1.75	.334
AUG	7.1	103	61	20	12	2440	.09	1.88	0
SEPT	7.2	150	98	18	15	2400	.13	.98	0
OCT	6.9	204	89	5	9	2810	.25	.84	0
NOV	7.1	172	85	6	10	2040	.18	1.49	0
DEC	6.3	164	84	4	12	2610	.12	1.11	0
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	7.6	136	119	9	11	2930	.11	1.29	.359

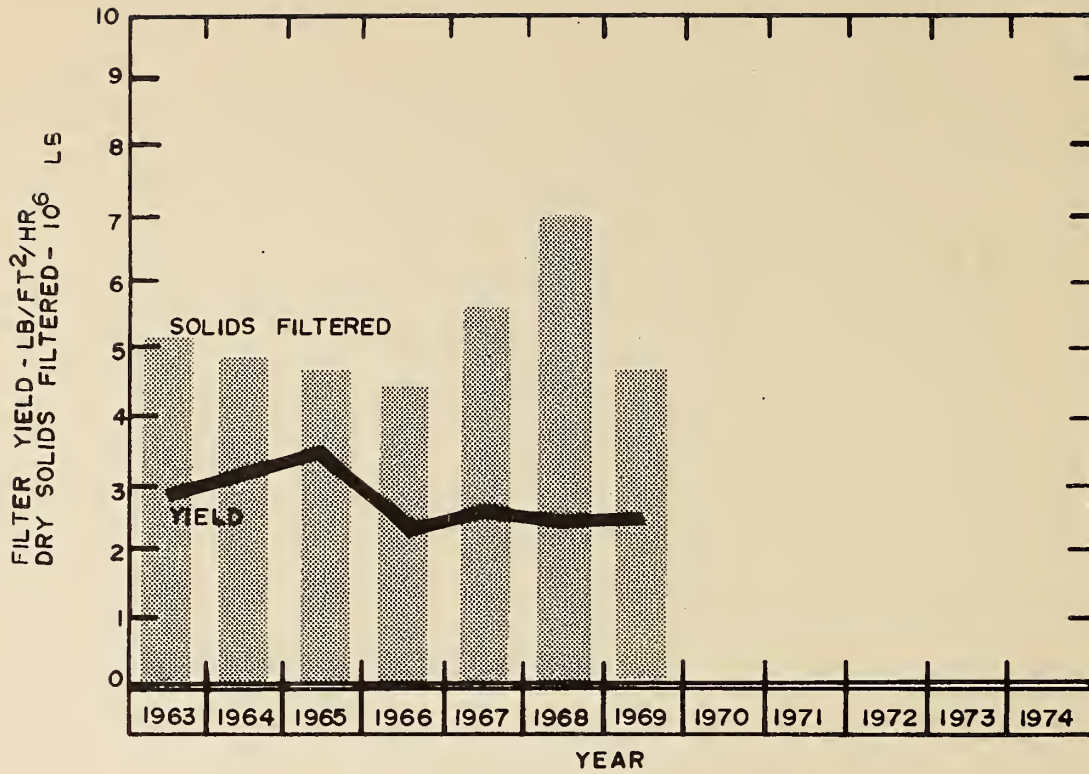


DIGESTION

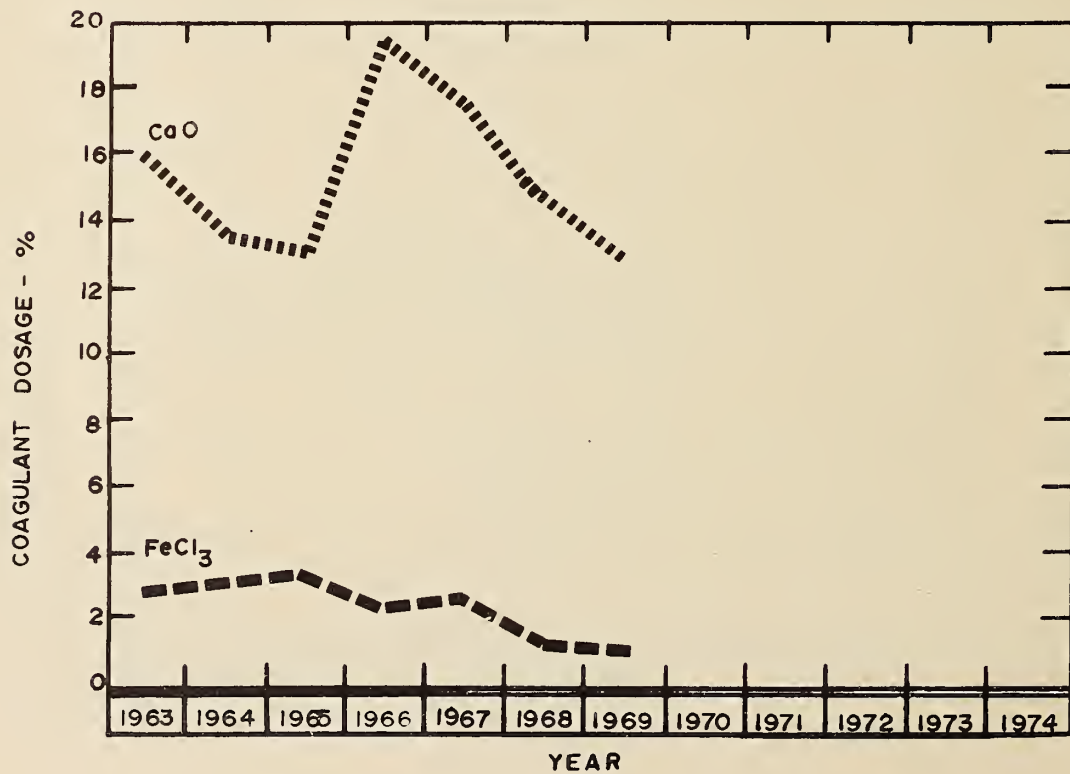


SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME	TOTAL SOLIDS	VOL SOLIDS	VOLUME	TOTAL SOLIDS	VOL SOLIDS	VOLUME	TOTAL SOLIDS	DEWATERED	LIQUID
	10 ⁶ gal	%	%	10 ⁶ gal	%	%	10 ⁶ gal	%	cu yd	cu yd
JAN	1.20	6.4	60	1.29	5.3	51	.037	.3	1518	0
FEB	1.04	5.8	54	.88	5.6	50	.048	.2	1134	0
MAR	1.37	6.1	64	1.21	5.5	50	-	-	1104	0
APR	1.50	6.1	59	1.48	5.3	55	-	-	972	0
MAY	1.61	5.7	59	1.65	5.4	53	.036	-	2346	0
JUNE	2.25	5.5	57	1.74	5.2	53	.004	-	1860	0
JULY	1.56	5.0	63	1.46	4.9	56	.117	.3	717	3684
AUG	1.21	4.9	59	1.25	4.5	55	.097	-	0	7424
SEPT	1.17	4.4	67	1.04	4.0	60	.107	-	0	6167
OCT	1.15	3.8	75	.90	2.8	64	.112	-	0	5348
NOV	.95	3.8	76	.36	2.7	67	.034	-	0	3955
DEC	1.12	4.3	78	.48	2.9	69	-	-	0	6436
TOTAL	16.12	-	-	13.74	-	-	.592	-	9651	33014
AVERAGE	1.34	5.1	64	1.14	4.5	56	.049	-	0	0



VACUUM FILTRATION



VACUUM FILTRATION

MONTH	TOTAL FILTER USE hr	SLUDGE		CONDITIONING CHEMICALS						FILTER CAKE % TS	FILTR. % TS	YIELD lb/hr sq ft
		TOTAL	DRY	CaO		FeCl ₃		POLYMER				
		SOLIDS %	SOLIDS 10 ³ lb	USED 10 ³ lb	DOSE %	USED 10 ³ lb	DOSE %	USED lb	DOSE ppm			
JAN	635	5.3	674	89.1	13	5.4	0.8	-	-	19.4	2.0	1.86
FEB	518	5.6	498	66.8	13	5.1	1.0	-	-	18.8	1.4	2.21
MAR	632	5.6	688	83.0	12	6.6	1.0	-	-	17.9	1.1	2.56
APR	709	5.3	796	107.2	14	8.4	1.1	-	-	18.7	2.3	2.07
MAY	783	5.4	887	113.2	13	9.5	1.1	-	-	18.9	1.1	2.84
JUNE	744	5.2	903	116.0	13	8.8	1.0	-	-	18.8	1.1	2.88
JULY	179	5.0	214	29.7	14	2.2	1.0	-	-	19.5	1.0	2.57
TOTAL	4200	-	4660	605.0	-	46.0	-	-	-			
AVERAGE	600	5.3	388	86.4	13	6.6	1.0	-	-	18.9	1.4	2.43

Note: Vacuum filtration was discontinued in July.



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